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Heavy Flavor Production and Energy Loss with Two-Particle Correlations at RHIC-PHENIX

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Heavy quarks are a valuable probe of the hot, dense medium created in a heavy ion collision, and are an important test of proposed mechanisms of energy loss. Originally, theoretical models for charm and beauty energy loss expected small values of suppression in the medium compared to light quarks. However, single non-photonic electrons are suppressed at a similar level to light hadrons, implying a comparable level of energy loss between light and heavy partons. Because theory has had a difficult time explaining the level of heavy quark energy loss, it is crucial to better understand charm and bottom suppression. A measurement in p+p is important because there are large uncertainties in the FONLL predictions of heavy quark yields; furthermore it serves as a baseline for heavy ion measurements. Correlated electron-muon pairs provide a clean measurement of heavy quark production in a rapidity range not yet studied. Modifications of the angular correlation between these pairs are sensitive to the amount of energy loss. A complementary measurement of electron-hadron correlations has also been made at PHENIX. These correlations are used to obtain bounds on the rate of charm versus bottom production, and they indicate heavy quark suppression.

Presented in this talk is a measurement of electron-muon azimuthal angular correlations in p+p collisions. This provides a baseline for a heavy ion measurement, and can also be used to extract the charm cross section. We will discuss the strategy for making this measurement in Au+Au collisions, which will allow us to study the mechanisms of heavy flavor energy loss. In addition to this measurement, electron-hadron correlation studies in p+p and Au+Au will be reviewed.